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A Comparative Study of Cotton and Rayon Glass Curtain Fabrics

Florence E. Petzel

OHIO
AGRICULTURAL EXPERIMENT STATION
Wooster, Ohio

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A COMPARATIVE STUDY OF COTTON AND RAYON GLASS CURTAIN FABRICS

FLORENCE E PETZEL

INTRODUCTION

PURPOSE

Through their questions and comments, consumers and other groups interested in textiles have evidenced considerable interest in the relative merits of cotton and rayon glass curtains. Therefore, it was the purpose of the present study to compare certain types of staple rayon and cotton glass curtain fabrics in terms of relative durability and serviceability. The cotton fabrics chosen included voile, scrim, marquisette, bobbinet, and filet net; and the rayon fabrics were voile, ninon, and marquisette.

NEED FOR THE STUDY

Difficulties of consumers in selection and care.—Consumers encounter various problems in buying glass curtains. One difficulty arises from the fact that there are numerous and sometimes conflicting factors to be weighed in making a choice. Glass curtains may be used to give privacy while permitting a view of the out-of-doors, or they may serve to shut out an unpleasant view. They admit light and air, sometimes altering or regulating the light. They may improve the appearance of the windows by softening the severe effect of the window lines, correct the proportions of the windows or other components of a room, or provide a decorative note in the room. All of these functions vary in importance in relation to individual situations.

While the buyer wishes curtains which will serve these purposes, she may also wish as durable and serviceable a product as possible. To be durable, a curtain fabric must withstand exposure to light, atmospheric conditions, and laundering or dry cleaning. To look well while in service, it must hold its color in spite of laundering and exposure to sunlight and atmosphere, resist wilting as well as possible, and not shrink excessively.

The relative importance of qualities considered by Missouri women in buying glass curtains was studied by Jessie V. Coles in 1936-1937 (6). She found that durability and attractiveness were mentioned about equally by city and small town women when they were asked what qualities they considered important. However, durability was believed the most important quality by the greatest proportion of women. Colorfastness, ease of laundering, and preshrinking were also considered essential by many; shrinkage and fading had been sources of difficulty to the great majority.

In addition to functional aspects and to durability and service features, the buyer needs to consider economic and energy factors. She should choose in terms of the fabric which best suits her requirements at a price which she can afford to pay. In this connection, she must consider not only original cost but also cost of upkeep. If curtains must be laundered frequently or dry cleaned rather than laundered, the cost of maintenance will be increased.

Moreover, the time and effort required in caring for curtains may be a factor in choice. Another difficulty is that of choosing from the many grades of a great variety of fabrics, chiefly of cotton and rayon, which have been available. Certain of these grades and kinds of fabrics were included in the present study.

Since so many factors enter into the choice of glass curtains and since such a wide variety of fabrics is available, the consumer should benefit from definite information regarding the serviceability and durability of staple glass curtain fabrics. However, the information supplied on bolts of curtain fabric is usually meager. It is likely to include only colorfastness, the fabric name, price, width, and manufacturer's name.

A study of advertisements of window textiles made by Iva L. Brandt and Ruth A. Allen at Iowa State College in 1940 indicated that more emphasis was usually placed on appearance and attractiveness than on durability and serviceability (4). The authors concluded that additional factual information would make advertisements more valuable to the consumer-buyer.

For the most part, information available in bulletins, textbooks, and reference books is also limited and generalized in nature. Even technical and professional journals contain little concrete information on specific fabrics for glass curtains.

Consumers are also interested in knowing how to care for their glass curtains. Some of their problems are whether to launder or dry clean curtains and whether to iron or stretch them after washing. These questions may be related to fiber content, yarn or fabric construction, and dyeing and finishing.

Extensive use and economic importance of glass curtains.—Casual observation of homes indicates the extensive use of glass curtains. When the size and number of windows in homes and the length of curtains is taken into account, it becomes apparent that considerable yardage is required for glass curtains and that their cost is likely to be an important item in furnishing the home.

The extent to which glass curtains are used, even by low-income families, is apparent from a study of 200 Alabama living rooms made by Sallie Partrich under the direction of Henrietta M. Thompson (reported in 1938) (13). "Shades were found in 92 per cent of the cases and glass curtains in slightly less than this." Moreover, one of the improvements most frequently desired was new curtains or draperies.

From an investigation of usage of household textiles by farm families of South Carolina in 1936 and 1937, Mary E. Frayser found that full-length glass curtains were used in 60.3 per cent of all households (10). The most frequent estimate of period of wear was 3 years.

In a study of living rooms of low-income farm families of Mississippi in 1935, Dorothy Dickens found somewhat lower percentages of homes with curtains of some type (7). She did not, however, distinguish between glass curtains and other types of curtains or draperies. In contrast to the low-income families, 84 per cent of 112 leaders of agricultural extension home management clubs had windows with "drapes."

Evidence of the economic importance of glass curtains is available from the Census of Manufactures. In 1939, 54,774,815 pairs or sets of curtains valued at $36,098,778 were produced. In addition, an unreported number of curtains valued at $1,723,388 was manufactured. These data do not include curtain fabrics sold at retail as yard goods (15). The production of combed or part-combed cotton voiles totaled 70,009,629 square yards. Some of this amount went into products other than curtains. The quantity of plain cotton marquisette manufactured was 64,084,036 square yards, and if clipped spot and beat-up spot marquisettes are added to this amount, the quantity of combed or part-combed cotton marquisette produced mounts to a total of 311,700,744 square yards. Among the rayons, 19,974,398 linear yards of rayon marquisette were manufactured (14). The production of bobbinet was not classified according to fiber; 279,460 equivalent linear yards valued at $841,629 were produced in 1939 (16).

In addition to the quantities given, glass curtain fabrics, especially those of finer grades, were imported from such countries as England, France, and Switzerland.

REVIEW OF LITERATURE

Since glass curtains are so extensively used, it is surprising that there is relatively little literature reporting experimental work on this type of fabric.

In 1925, Mildred Dodds reported that direct sunlight from the south caused the greatest fading and loss in breaking strength in curtain fabrics, slanting rays of light from the east and west produced less change, and light from the north caused the least change in strength and color (8).

In 1930, Sara Moody made a study of Bemberg curtain fabrics (12).

As part of an analysis of 300 fabrics, Rachel Edgar reported results of tests on cellulose acetate ninons and on cotton bobbinet, filet net, voile, and marquisette (9). Physical and chemical analyses were run on these fabrics, but no study was made of the effects of light or laundering on color or strength. With the exception of ninon, only one example of each type of fabric was tested.

In 1933, Mary Anna Grimes reported a study of "The Effect of Sunlight and Other Factors on the Strength and Color of Cotton Fabrics" (11). Among the fabrics tested were cotton voiles. One of the factors affecting tendering by light was sizing; voiles containing the most size had tendered the most. Mercerization was found to decrease tendering. Evidence was obtained to show that vat "...... colors absorbing the shorter wave lengths cause greater tendering than those reflecting these wave lengths." In general, dark colors were more resistant to tendering than light colors. With one exception, the voiles, which were dyed with direct dyes, tendered more than fabrics dyed with vat dyes. Fabric structure was also found to have some relation to tendering, the thicker, heavier fabrics were tendered less than the voiles. The fabrics usually tendered more in the filling than in the warp direction because the greater percentage crimp of the filling yarns than of the warp yarns " ..... caused more of the filling to appear on the surface of the fabric with a consequent protection from the light of the warps lying beneath them." Coarse, hard twisted, single yarns were more resistant to tendering than fine, soft twisted, double yarns.

Conditions of exposure to sunlight were also related to tendering. Length of exposure had the greatest effect; temperature ranked second; and relative humidity, third.

All fabrics faded in sunlight, but vat dyes were, in general, much more fast to sunlight than direct dyes. Price was no indication of fastness. The voiles were the least fast of the three types of fabrics, but were the most expensive. In general, dark colors were more fast to light than light colors. Some colors became darker and some lighter after exposure. The rate of fading also varied.

Grimes concluded that "in purchasing cotton fabrics which will be exposed to sunlight, the consumer should consider not only price per square yard, but also the guarantee. The fastness of the dye is not dependent upon the color. Fast dyes may be secured in any color, if there is wise selection in the choice of the individual dye or in the combination of dyes."

In 1939, Eugenia Clark reported a study of "Some Factors Which Influence the Durability of Certain Curtain Fabrics" (5). Of the ten types of fabrics tested, the voile, filet, and rayon marquisette were comparable to some fabrics included in the present study. In addition to a general analysis of the fabrics, tests were conducted to determine the relative effects of north, south, east, and west exposures, as well as laundering, upon color, shrinkage, and breaking strength.

Clark ranked the fabrics on the basis of durability as follows: voile, dotted lawn, theatrical gauze, Celanese "casement cloth," dotted swiss, marquisette, rayon marquisette, and novelty net. Sunlight and atmospheric conditions caused a decided decrease in breaking strength in every fabric, and laundering further decreased breaking strength. Exposure at east windows caused the greatest decrease in breaking strength; the south, west, and north exposures followed in order of effect. Clark concluded that the greater decrease in the east may have been the result of these fabrics' becoming wet.

Relatively few studies have been made of specific glass curtain fabrics. Apparently, relatively few kinds of glass curtain fabrics have been studied, and most studies have included only one example of a given type of curtain fabric, rather than varied qualities sold at different prices. Also, little has been done to compare similar types of cotton and rayon glass curtains. Some studies have been made of the effects of different directions of exposure to sunlight on fabrics, but less information is available on the effects of various methods of laundering on glass curtains.

FABRICS AND METHODS

FABRICS STUDIED

Fiber content.—The fabrics studied were alike in that they were unhemmed cottons and rayons of ecru or a closely related color purchased by the yard in May 1938. The relative importance of cotton and rayon curtains was indicated by an investigation made by Coles in 1936-1937 (6). Cotton was the fiber "usually used" for living room glass curtains by about 62 per cent of the people in cities and small towns, and it was even more important in bedroom curtains; over 85 per cent of the women reported having usually used it for this purpose. A considerable portion usually used cotton and rayon mixtures, especially for living rooms; and a smaller proportion (under 10 per cent) usually used rayon.

Kinds of fabrics.—The kinds of fabrics selected for study were those of relatively standard constructions, rather than novelty types. Among the cottons were four voiles, three scrims, nine marquisettes, four bobbinets, and six filets. The rayons included four marquisettes, two voiles, and four ninons. The number of examples of each kind of fabric depended partly on the popularity of the fabric and partly on the range of variations available. An attempt was made to secure a representative group of fabrics varying in price and quality. Since wider ranges in price and quality were to be had in some fabrics than in others, the number of fabrics of each type varied accordingly. Marquisettes were available in the greatest number. This fact agrees with the findings of Coles to the effect that marquisette was the most popular fabric for both living rooms and bedrooms (6). Net ranked third and filet net fourth for living rooms. Net and filet were little used for bedrooms, but voile occupied third place. In some types of fabrics, such as filet, variation in weight among individual fabrics was gradual, but in others, such as scrim and cotton and rayon marquisettes, there were two distinct weight groups. In the latter case, the two weights were grouped separately in the analysis of data.

Color.—As far as possible, ecru was chosen because it was the color most commonly used for glass curtains and because it might be expected to present problems of colorfastness. When a fabric was not available in ecru, it was purchased in a lighter color, such as cream or eggshell. Coles found that ecru and cream were the colors preferred for living room curtains (6). A considerable number also preferred cream curtains for bedrooms.

Width.—To facilitate the establishment of price relationships, an attempt was made to purchase fabrics about 40 inches in width. However, in some cases it was necessary to buy other widths in order to obtain the desired grades of different kinds of fabrics. Widths, therefore, varied over a considerable range. Some fabrics, such as bobbinet, were usually wider than others, such as scrim. Also, some fabrics, such as ninon and cotton marquisette, were available in a great range of widths.

Price per running yard.—Because of the desire to determine what relationship, if any, existed between price and durability or service, fabrics were selected which were representative of different price lines of each kind of fabric. Prices per running yard ranged from $0.06 for a cotton marquisette to $1.25 for a filet net.

Stores.—Fabrics were purchased from stores in Columbus, Ohio, and from one mail-order house. Twenty-five fabrics were obtained from three department stores, five from a furniture store, five from a mail-order house, and one from a variety store. Coles found that the majority of buyers, especially in cities, usually patronized department stores (6). A considerable proportion, particularly in small towns, usually purchased from mail-order houses, and few usually purchased from specialty stores.

METHODS OF TEST

As far as possible the methods of test were those set up by Committee D-13 of the American Society for Testing Materials. In some cases, however, it was necessary to adapt these methods to suit the fabrics tested, the purpose of the test, or available testing facilities. Breaking strength, elongation, and the number of twists per inch were determined at a temperature of $70° \pm 2°$ F. and a relative humidity of $65\% \pm 2\%$. Other tests were made at ordinary room conditions, except for weighings for weight in ounces per square yard and yarn size, which were done on the oven-dry basis.

Width.—The American Society for Testing Materials method for determining width was followed (2). A steel tape was used to measure width to the nearest sixteenth of an inch. The average of 10 such measurements was taken as the width of the fabric.

Price per square yard.—From the price per running yard and the average width in inches, the price per square yard was calculated. This made possible the comparison of fabrics of different widths on a price basis.

Fiber content.—Fiber content was determined by microscopic examination, burning, and solubility in acetone.

Number of plies.—Yarns were untwisted and the number of plies observed.

Yarn number.—Since the object of this test was to determine the relative size of yarns in the various fabrics, the yarn number was calculated by the typp[1] system on the oven-dry basis. Ten yards of yarn were raveled in each direction from various parts of the fabric. Each sample was weighed air dry on an analytical balance. Samples were then dried at 105 to 110° C. until a constant weight was obtained. The number of thousands of yards per pound was then calculated on the oven-dry basis. These tests were run in triplicate. Because of the difficulty encountered in raveling, yarn number was not determined for bobbinets or filets.

Twist.—The determination of twist of single yarns was conducted at constant temperature and humidity according to the method of manually applied tension and dead-weight control (2). A Suter Precision Twist Tester was used. Twist of plied yarns was also determined in accordance with the standard method. After removing twist in the plied yarn, all but one ply were cut away at the clamps, the remaining ply reset in the clamps, and the twist in this single ply determined in the same way as for single yarns. The average of 10 determinations was taken as the number of twists per inch. Direction of twist was also noted. Twist was not determined for bobbinets and filets because of the difficulty involved in removing yarns.

Yarn count.—The yarn count of all woven fabrics was determined by means of a Suter pick counter and a dissecting cabinet. The American Society for Testing Materials procedure was followed (2). The average of 10 counts in each direction was calculated as the yarn count of the fabric.

Mesh count.—In the case of nets, it was necessary to take a mesh count instead of a yarn count. To give some idea of relative openness of construction and because of the paired arrangement of warp yarns, mesh counts were also made on marquisettes. Each count was made for a distance of 3 inches. From the average of 10 counts in each direction, the number of meshes per inch was calculated.

Thickness.—The thickness of fabrics was measured with the aid of a Randall Stickney thickness gauge, by the American Society for Testing Materials method (2). The average of 10 determinations was taken as the thickness of the fabric.

Weight.—The determination of weight in ounces per square yard was carried out in accordance with the American Society for Testing Materials method, except that it was done on the oven-dry basis (2). The test on each fabric was run in duplicate. For each determination, five 2-inch squares were cut from each fabric with a die and maul. These samples were weighed air dry; they were dried to a constant weight at 105 to 110° C.; and weight in ounces per square yard was calculated.

Breaking strength.—Breaking strength was determined at constant temperature and humidity according to methods of the American Society for Testing Materials (2). The average of 10 determinations in each direction of test was taken as the breaking strength of the fabric.

[1]Under the typp system, fineness of yarns is indicated by the number of thousands of yards per pound avoirdupois.

The raveled-strip method was used for original wet and dry strength and for strength after exposure to light at a north window, in a fading frame, and in a Fade-Ometer. This method was employed for fabrics exposed to light because of the limitations of space for exposure and the size of the holders used in the Fade-Ometer. Wet breaking strength of samples was tested after soaking for 2 hours in tap water in the conditioning room. Specimens were broken within 1 minute after removal from the water. The change in strength in pounds and in per cent due to wetting and to exposure to light was calculated

Because space was not a limiting factor in laundering, and because the raveled-strip method did not give as satisfactory results on nets as on woven fabrics, the grab method was used to determine the effect of laundering. The change in strength in pounds and in per cent due to laundering by various methods was calculated.

Elongation.—Elongation was determined on the original dry samples in connection with breaking strength tests. Determinations were made on raveled-strip samples by the American Society for Testing Materials method (2). The average of 10 tests in each direction was taken as the average elongation.

Sizing, finishing, and other nonfibrous materials.—Tests for sizing, finishing, and other nonfibrous materials were run in triplicate on 7-inch squares. Each sample was dried to a constant weight at 105 to 110° C. to obtain the oven-dry weight of the specimen. The sample was then extracted in a Soxhlet apparatus for 4 hours with 200 milliliters of carbon tetrachloride. It was next dried and weighed as before. It was again extracted in a Soxhlet apparatus with 150 milliliters of 95 per cent ethyl alcohol for 4 hours. Then it was dried and weighed. The sample was placed in a beaker and covered with 50 milliliters of 2 per cent diastase of malt solution. It was then placed in an incubator at 70° C. for one hour. It was rinsed by allowing warm water to flow over it for one-half minute, then rinsed in three changes of distilled water and boiled for 1 hour in distilled water. This water was drained off and the sample rinsed three times in distilled water. Samples were squeezed and dried to constant weight as before. Total sizing and finishing materials and the amounts removed by carbon tetrachloride, ethyl alcohol, and diastase were calculated.

Exposure to sunlight.—Raveled-strip breaking strength samples were exposed to sunlight in a fading frame in accordance with the American Society for Testing Materials method (2). Samples were exposed for a total of 100 hours between July 8, 1938, and August 20, 1938.

Exposure in a north window.—Raveled-strip samples for breaking strength determinations were hung at the lower halves of north windows from August 29, 1938, to May 26, 1939, an interval of approximately 9 months. This period was selected on the basis of tests conducted at the Bureau of Standards which indicated this period of exposure to be approximately equivalent to 100 hours of sunlight.

Exposure in a Fade-Ometer.—Raveled-strip samples for breaking strength determinations were exposed in an LV type Fade-Ometer for 76 hours and 56 minutes. On the basis of directions for the use of the Fade-Ometer, this period was supposed to be approximately equivalent in effect to 100 hours of sunlight on a cloudless day in midsummer in the northern part of the United States. The center portion of each sample was exposed.

Laundering for determination of effect on breaking strength.—For laundering tests, modifications of the 1941 American Society for Testing Materials standards for fastness to laundering were used (3). A fabric of moderate price and quality selected to represent each class of fabrics was laundered 20 times. These fabrics included cotton voile 2, scrim 6, viscose voile 8, cuprammonium voile 9, ninon 10, cotton marquisette 20, viscose marquisette 23, acetate marquisette 26, bobbinet 28, and filet 33.

Fabrics which could not be ironed satisfactorily, such as marquisettes and nets, were washed and stretched. One set of fabrics of plain weave construction was washed and ironed and the other set washed and stretched. For each type of treatment, hemmed samples large enough to supply the 4 x 6-inch samples for warp and filling breaking strength tests were prepared. Because of the limitations of width of fabric and size of Launder-Ometer bottles, two 9 x 17-inch pieces and one 9 x 20-inch piece were cut for each method of treatment in each direction of test. This size allowed for maximum probable shrinkage. Twill tape was sewed around the edges of each sample to be stretched in order to pin the samples to the stretcher by this tape, and thus reduce damage to the fabric. This is a method recommended by Balderston to prevent damage to curtains in stretching (3).

Except for ninon and cotton scrim, two strips of a given fabric were washed together in one jar in the Launder-Ometer. In the case of cotton fabrics, the cloth was placed in a jar with 250 milliliters of 0.5 per cent soap solution at 49° C. and rotated for 30 minutes at this temperature (a modification of test number 1 for cotton). The fabric was then removed from the bottle, squeezed gently, and rinsed four times. The jar was rinsed with water before the first rinse of the fabrics. Each rinse was carried out in the Launder-Ometer for 1 minute with 10 rubber balls. Two hundred milliliters of water or solution were used in each jar, except in the case of scrim, for which one-half of this amount was used. The first two rinses were in water at 40.6° C., the third in 0.05 per cent acetic acid at 26.7° C., and the fourth in water at 26.7° C. Distilled water was used throughout. Samples were removed from the jars, rolled in bath towels, and excess moisture squeezed out.

Samples to be stretched were then placed on stretchers to dry. These curtain stretchers had sharp-pointed pins set 1 inch apart, and they were cut and fitted together so that the samples would fit on them.

The remaining samples were ironed with a Hotpoint hand iron with the temperature control set at "cotton." To prevent stretching as much as possible, the iron was brought down flat upon the fabric without a horizontal pushing motion. Ironed samples were then placed on a flat surface at room temperature for 3 or 4 hours. Ironed and stretched samples were examined after each laundering process for the occurrence of breaks or any notable change in appearance.

In the case of rayon fabrics, the laundering process differed in that a temperature of 38° C. was used throughout, and no balls were placed in the jars, either in washing or rinsing. Three distilled water rinses of 1 minute each were used. The volume of water was 250 milliliters for the first rinse and 200 milliliters for each succeeding rinse for all rayon fabrics except ninon. In the case of the latter, 100 milliliters of water were used for each rinse. Samples were squeezed between rinses and after the final rinse. They were then rolled in bath towels and ironed or stretched as for cotton. In ironing, the temperature control was set at "silk."

Colorfastness to light.—Observations of fading were made on the samples exposed to sunlight. These samples were laid out on a horizontal surface beside a south window, and fading was observed by two persons who classed it as marked, moderate, slight, or not noticeable.

Colorfastness to laundering.—The colorfastness to laundering was tested according to the 1941 standards of the American Society for Testing Materials (1). Cottons were subjected to tests number 1 and number 2. Test number 1 was a relatively mild treatment in the Launder-Ometer with 0.5 per cent soap solution and 10 rubber balls at $120° \pm 2°$ F. for 30 minutes. Test number 2 was carried out at $160° \pm 2°$ F. with 0.5 per cent soap, 0.2 per cent soda solution, and 10 rubber balls for 45 minutes. Washing was followed by four rinses and pressing. Fabrics which showed no appreciable change in color and no appreciable staining of the attached white cloth were considered fast to commercial laundering and domestic washing by each method. Samples were also compared with reference standard dyeings.

Rayons were washed in the Launder-Ometer in 0.5 per cent soap solution at 100° F. for 30 minutes, rinsed three times, and pressed. Fabrics which showed no greater loss of color or staining of the undyed fabrics than a reference standard were classed as fast to laundering or domestic washing, without the aid of a bleaching agent.

Shrinkage in laundering.—As it seemed desirable to launder cotton and rayon by comparable procedures which would more nearly approach home methods, the standard method of test for shrinkage of cottons was not used. Cottons were laundered according to the method for testing rayon, except that the temperature for washing was 120° F. and for rinsing 105° F. These were the temperatures specified for the washing and first rinse in the test for colorfastness of cotton to laundering (2). In the case of rayons, the standard method of test for maximum residual shrinkage of rayon woven fabric was followed (2). The average shrinkage was calculated from measurements on two samples of each fabric.

RESULTS

WIDTH AND PRICE PER SQUARE YARD

Width.—Widths of the fabrics purchased ranged from 34.6 inches to 54.4 inches (table 1). Cotton bobbinets were the most uniformly wide fabrics, averaging 52.8 inches in width. Viscose rayon marquisettes and cotton filets also tended to be wide.

Price per square yard.—Price per square yard ranged from $0.06 to $1.02 (table 1). Price ranges for individual types of fabrics varied considerably, being greatest for filet net and cotton marquisette. When the fabrics were grouped according to average price per square yard, cotton marquisettes constituted the group costing $0.30 or less; lightweight rayon marquisette, scrim, and cotton voile were in the class costing $0.31 to $0.60; and bobbinet, ninon, filet, rayon voiles, and heavy rayon marquisette cost $0.61 or over. In general, rayon fabrics cost more than similar types of cotton fabrics.

FIBER CONTENT

Among the plain weave rayon fabrics were one viscose rayon voile, one cuprammonium rayon voile, and four cellulose acetate rayon ninons (table 1). The lightweight rayon marquisettes included one cellulose acetate and two viscose rayon fabrics, and the heavy rayon marquisette was of viscose rayon. The remainder of the fabrics were of cotton.

YARN CHARACTERISTICS

Number of plies.—Scrim, heavy cotton marquisette, bobbinet, and filet net were characteristically made of ply yarns, but all of the rayon fabrics were made of single yarns (table 2). In cotton voiles and lightweight cotton marquisettes there was some relation between price and the number of plies. The lowest priced cotton voile was made from singles and the three higher priced fabrics from plied yarns. The four light-weight marquisettes costing least per square yard were made from singles, while the three more expensive fabrics were made from two-ply yarns.

Yarn number.—In general, warp yarns were smaller than filling yarns except in the viscose voile, heavy scrim, one lower priced cotton marquisette, one lightweight, and one heavyweight viscose rayon marquisette (table 2). There was not a clear-cut relation between price and size of yarn.

Except in the case of cotton marquisette, the variation in yarn size for a given kind of fabric was relatively small. The heaviest yarns were in heavy scrim and heavy cotton or rayon marquisettes. Lightweight scrim was made from relatively heavy yarns. Among the fabrics containing yarns of moderate weight, lightweight cotton marquisette tended to be made from lighter yarn than lightweight rayon marquisette. Cotton voile was generally made from lighter-weight yarns than marquisette. The lightest yarns were used in rayon voile and ninon. Cotton yarns were heavier than yarns of corresponding rayons in the case of heavy marquisette and voile, but the opposite was true of lightweight marquisette.

Twist.—As is to be expected, twist tended to be higher in fabrics made from relatively fine yarns (table 2). This was outstandingly true of scrim and of both rayon and cotton marquisette. There appeared to be some relation between price and twist in the plied voiles, the lightweight scrims, and in the four lowest priced, single-ply, cotton marquisettes. The other fabrics showed no marked relation of twist to price. As a group, cotton voiles had the highest twist; scrims and plied, lightweight cotton marquisettes had somewhat less. Rayon fabrics were made from yarns with less twist than yarns of corresponding cotton fabrics. In rayon, as in cotton, voile yarns had somewhat more twist than marquisette yarns.

FABRIC CHARACTERISTICS

Yarn count.—In all woven fabrics there was a greater number of warps than fillings per inch (table 2). The closest balance occurred in scrim and ninon, and cotton and rayon voiles were fairly well balanced. The warp count was much higher than the filling count in marquisettes because of the paired arrangement of warps.

There tended to be a relationship between yarn number and yarn count; the fabrics made from the finest yarns were most closely woven. The highest yarn counts occurred in cuprammonium voile and ninon. Viscose and cotton voiles also had high counts. Moderate counts were characteristic of lightweight cotton and rayon marquisette and of lightweight scrim. Heavy scrim and heavy cotton and rayon marquisette had the lowest yarn counts. Within each type of fabric, the variation in yarn count was low, except for lightweight marquisette and the filling of ninon.

In general, there was not a consistent or pronounced relationship between price and yarn count except in the filling direction of lightweight cotton marquisette. As a group, the four higher priced, lightweight cotton marquisettes had a markedly higher yarn count in both directions than the three lowest priced fabrics.

Mesh count.—The mesh count of bobbinet varied little from one fabric to another, but there was a wide range of mesh counts in filet, varying from 6.9 to 12.6 in the warp direction, and from 6.9 to 12.0 in the filling direction (table 2). The mesh in filet was approximately square. The actual mesh count agreed very closely with the fineness in "points" as stated by the salesperson. Price tended to increase as the size of mesh in filet net decreased. In rayon marquisettes there was a pronounced tendency for the filling mesh count to exceed the warp mesh count, giving an oblong mesh. In the three lowest priced, lightweight cotton marquisettes, the warp mesh count was slightly greater than the filling mesh count, but the opposite was true of the four higher priced cotton marquisettes and the heavy cotton marquisettes. This difference was associated with the poor balance in yarn count of the inexpensive cotton marquisettes.

Thickness.—The thin fabrics included rayon voile, ninon, and cotton voile (table 2). The medium group included lightweight cotton and rayon marquisette, lightweight scrim, and bobbinet. The thick fabrics were heavy rayon and cotton marquisette, filet, and heavy scrim. There was little variation in thickness among individual fabrics of each type, with the exception of bobbinet and filet net. The thickness of filet net decreased as price and mesh count increased. Marquisette and scrim, of course, were of two distinct classes on the basis of thickness.

Weight.—On the basis of weight, the fabrics studied fell into two groups (table 2). Scrim and heavy cotton and rayon marquisette weighed between 2 ounces and 4½ ounces per square yard. With few exceptions, the rest of the fabrics weighed between 1 and 2 ounces per square yard. There was relatively little variation in the weight of ninons and cotton voiles. Scrim, bobbinet, and cotton and rayon marquisette each occurred in two distinct weight classes. The weight of filet net tended to decrease with increasing price and increasing mesh count, but the weight of lightweight cotton marquisette tended to increase with increasing price.

Breaking strength.—Cotton fabrics tended to be stronger than corresponding rayon fabrics, except in the filling direction of lightweight cotton marquisettes (table 3). Cuprammonium voile closely approached cotton voile in strength. Scrim, especially in the heavy weight, was the strongest fabric. Heavy cotton marquisette and heavy viscose rayon marquisette also ranked high. The moderately strong group of fabrics included cotton voile and cuprammonium voile. While lightweight cotton and viscose marquisette were moderately strong in the warp direction, they were relatively weak in the filling. The relatively weak fabrics (usually under 20 pounds breaking strength in both directions) included filet net, viscose voile, ninon, bobbinet, and cellulose acetate marquisette. Bobbinet and filet net were exceptionally weak in the filling direction when tested by the strip method, but when they were tested by the grab method in connection with laundering tests, the difference between warp and filling strengths was relatively small. Filet net tended to be stronger than bobbinet.

As might be expected from the yarn count, marquisette was usually poorly balanced in strength. This lack of balance was especially serious in lightweight fabrics, in which the filling strength was very low. It is likely, therefore, that these fabrics would split lengthwise. The plain weave fabrics were relatively well balanced, though all were stronger in the warp than in the filling direction.

There was a relation between price and breaking strength in lightweight cotton scrim, heavy cotton marquisette, and lightweight viscose marquisette. A relationship between price and breaking strength also existed among the three lowest priced cotton voiles and the filling direction of the five lowest priced, lightweight cotton marquisettes. In neither of these types of fabrics was the highest priced fabric the strongest. In scrims, yarn number, twist, and filling yarn count were possible factors. Yarn number appeared to be the chief factor associated with higher strength in the more expensive heavy cotton marquisette. Differences in physical properties of lightweight viscose marquisette were small. In voiles, factors responsible for the price relation may have been filling yarn number, ply yarns, and increasing yarn twist. In the filling direction of lower priced cotton marquisettes, twist, ply yarns, and yarn count may have influenced strength.

Elongation.—Elongation varied with fiber content (table 5). Rayons showed greater elongation than similar cotton fabrics. Cuprammonium voile had less elongation than most of the rayon voiles and ninons, and some of the ninons had the highest elongation of any of the plain weave rayon fabrics.

In general, elongation was greater in the filling than in the warp direction, except for some ninons and rayon and cotton marquisettes. Fillingwise elongation exceeded warpwise elongation most markedly in filet net and cellulose acetate marquisette. One bobbinet also had very high filling elongation because the fabric had been stretched a great deal in the warp direction in finishing.

For the most part, the higher priced, plied cotton voiles and marquisettes had greater elongation than the corresponding lower priced fabrics made from single-ply yarns.

Sizing, finishing, and other nonfibrous materials.—The type of fabric which was usually the most heavily sized was filet (table 5). Scrim and cotton voile were, in general, sized the least. One bobbinet and one lightweight viscose marquisette contained exceptionally large amounts of sizing. Some of the least expensive fabrics, such as cotton marquisette and filet, were markedly more heavily sized than higher priced fabrics.

CHANGES IN BREAKING STRENGTH RESULTING FROM VARIOUS TREATMENTS

Change in breaking strength after exposure to light.—Although an attempt was made to expose samples for an equivalent length of time at north windows, in fading frames, and in the Fade-Ometer, the effects of each kind of exposure were different (table 3). Exposure to light in a north window caused a greater loss in strength in most fabrics than did exposure to sun in a fading frame or exposure in a Fade-Ometer. This difference may have been partly due to the effect of the dirt which collected on the samples hung at the north window. In general, exposure in the fading frame caused a greater loss of strength than exposure in a Fade-Ometer.

In noting the effect of light on breaking strength, it is well to consider both the strength in pounds after exposure and the percentage loss in strength. The breaking strength of a number of fabrics fell below 15 pounds in one or both directions after exposure to light by one or more of the three methods. These fabrics included the cheapest cotton voile, viscose voile, cuprammonium voile, ninon, lightweight cotton marquisette, lightweight viscose marquisette, cellulose acetate marquisette, bobbinet, and filet. In a number of these fabrics, the low strength occurred only in the filling direction after the fabric had been exposed at a north window, since this was the weakest direction and the most severe treatment. On this basis, the most desirable fabrics were more expensive, plied cotton voiles, scrim, heavy cotton marquisette, and heavy viscose rayon marquisette.

On a percentage basis, the lightweight viscose marquisettes, cellulose acetate marquisette, and some cotton marquisettes lost especially high proportions of their strength after exposure to light (table 4). In some cases filets and cuprammonium voiles also lost high percentages of strength. In general, price was not consistently related to percentage loss in breaking strength.

Change in breaking strength when wet.—Nearly all cotton fabrics were stronger when wet, and the losses in strength that did occur were slight (table 4). In spite of gains in strength, the wet filling breaking strength of the lowest priced cotton voile, lightweight cotton marquisette, bobbinet, and filet were below 15 pounds. All rayons lost markedly in strength when wet. All viscose rayon fabrics decreased in strength more than 50 per cent when wet, one losing 64 per cent. Cuprammonium voile lost a slightly greater percentage of its strength than did ninon. In general, cellulose acetate rayons decreased in strength the least when wet; losses ranged from 32 to 47 per cent. These losses were even more significant in the light of the low breaking strength in pounds when wet (table 3). The strengths of wet viscose voile, cuprammonium voile, ninon, lightweight viscose marquisette, cellulose acetate marquisette, and the filling of heavy viscose marquisette were below 15 pounds.

Change in breaking strength after laundering.—In general, cotton fabrics lost only relatively small percentages of strength or even gained in strength, probably because of the increase in yarn count resulting from shrinkage (table 6). Changes in strength of cottons ranged from a gain of 11.0 per cent for ironed voile to a loss of 11.6 per cent for stretched bobbinet. Rayons, on the other hand, usually lost considerably in strength as a result of laundering, and in no case did they gain in strength. Losses in strength of rayons ranged from 0.4 per cent for stretched ninon tested in the filling direction to 33.4 per cent for stretched viscose rayon marquisette tested in the warp direction. In every case except one (stretched ninon warp), cottons lost appreciably less strength than rayons of similar construction subjected to the same type of test.

The rank of sheer, plain weave, ironed fabrics in ascending order on the basis of percentage loss in strength was as follows: cotton voile, viscose voile, cuprammonium voile, and ninon. When stretched, these fabrics fell in the same order except that the loss in strength of ninon was very low. When marquisettes were stretched, cotton showed the least loss in strength and viscose the greatest loss, with cellulose acetate occupying an intermediate position.

Every fabric except one lost a greater percentage of its strength or gained a smaller percentage after laundering if it was stretched than if it was ironed. Cellulose acetate rayon ninon, however, lost greatly in strength when ironed but lost only slightly when stretched.

In most cases, percentage gains were greater and losses smaller in the filling direction than in the warp direction. Exceptions were scrim and cellulose acetate rayon marquisette.

There were also some subjective observations of appearance and texture which would be important to consumers. Fabrics were often flatter and had more body when stretched than when ironed. This was especially true of rayons. Stretching did not completely remove wrinkles in ninon. In fabrics made from highly twisted yarns, such as cotton voile, viscose voile, and viscose marquisette, some irregularity of yarn due to twist was visible after stretching, but it was less than when the fabrics were ironed. Ironing, in general, gave a softer finish. It did not completely remove wrinkles from some fabrics, such as ninon and cuprammonium voile. It was necessary to iron ninons carefully to avoid damage from heat.

COLORFASTNESS

Colorfastness to light.—After exposure to direct sunlight in fading frames, most fabrics faded to a noticeable degree. The color was usually lighter after exposure, but in some cases, there was a definite change in hue. The most marked color change was from a dark ecru to a bright red-orange in a cellulose acetate marquisette. This was so great a change that it is unlikely that the faded fabric would harmonize with the color scheme of a room for which the original fabric might have been selected. The next most marked change of hue occurred in two ninons, which changed from ecru to mauve. The other two ninons, however, faded only slightly. Some fabrics, such as two cotton marquisettes and one ninon, became slightly more yellow.

It is difficult to generalize on factors associated with colorfastness. Price seemed to be related to the colorfastness of cotton marquisette and filet, the two kinds of fabric which varied most in price and of which the greatest number of examples were studied. In some fabrics, such as cotton voile, bobbinet, and viscose marquisette, the degree of fading was about the same, regardless of price. In others, such as ninon, it varied considerably, but without relation to price.

It is also difficult to generalize on the relation of fiber content to colorfastness. On the whole, the color of viscose rayon marquisettes was more fast than that of cotton marquisettes, but there was not a consistent relation between fiber content and colorfastness of ninons and of cotton and rayon voiles. The three fabrics which changed most in hue were cellulose acetate rayons. These cases may have been due partially to atmospheric fading.

In general, the lighter eggshell colors faded much less markedly than darker ecru. This was especially true of eggshell bobbinets, cuprammonium voile, and some ninons as compared with ecru viscose voile, scrims, filets, and cotton and rayon marquisettes.

Colorfastness to laundering.—There were no evident differences between the colorfastness to washing of cottons and rayons when the standard tests were used. Most fabrics faded at least slightly. In the majority of cases there was little or no difference between fading of cottons washed by the gentle and severe methods, but two of the lowest priced cotton marquisettes faded markedly more when washed by the severe method.

Although one washing had little effect in all but these 2 cases, 20 washings caused marked fading in most of the 10 fabrics so treated. The exceptions were cotton voile and bobbinet, which faded to only a moderate degree. Both light and dark colors faded perceptibly. Cottons became lighter after 20 washings, but none changed in hue as strikingly as did 3 of the rayons—viscose voile, ninon, and cellulose acetate marquisette.

A comparison was made between the colorfastness to 100 hours of exposure to sunlight and to 20 launderings of the 10 fabrics laundered this number of times. Laundering caused greater fading than sunlight in eight of the fabrics. Light caused slightly more fading in cotton voile, and bobbinet faded to about the same degree as a result of each type of treatment.

Although light and laundering affected chiefly the value of the cottons and viscose marquisette, they had a striking effect on the hue of the other rayons. The change in hue of viscose voile, cuprammonium voile, ninon, and cellulose acetate marquisette as a result of the two treatments was entirely different.

SHRINKAGE IN LAUNDERING

Percentage shrinkage of individual fabrics ranged from a gain of 2.9 per cent in the warp direction of a bobbinet to a shrinkage of 26.0 per cent in the filling direction of another bobbinet (table 7). Average shrinkage for each kind of fabric was 10 per cent or less except in both directions of viscose marquisette and the filling of cotton marquisette and bobbinet. High shrinkage in these fabrics indicated the necessity for stretching them. Ninon, cuprammonium voile, and heavy scrim shrank a relatively small amount in both directions. There was no consistent difference between the shrinkage of cottons and rayons of similar construction.

In the majority of cases, the shrinkage was great enough to make an appreciable difference in the size of a curtain after laundering. Shrinkage in inches per yard ranged from a gain of 1.0 inch to a shrinkage of 9.4 inches in bobbinet.

Most of the cotton fabrics shrank more on the filling than on the warp. Exceptions were five of the filets. The majority of the rayons shrank most in the warp direction; exceptions were two ninons and the cellulose acetate rayon marquisette. Differences between warp and filling shrinkage in the same fabric were greatest for cotton and viscose marquisettes and for bobbinet. If these fabrics had been stretched, differences between warp and filling shrinkage probably would not have been as great.

Price was not closely related to shrinkage. In some cases the expensive fabrics shrank more than the cheap ones.

CONCLUSIONS AND RECOMMENDATIONS

PURCHASING FABRIC

Price as an indication of quality.—The relationship between quality and price per square yard varied for different types of fabrics. The highest-priced fabrics gave evidence of greatest durability (in terms of breaking strength) in the case of lightweight scrim and heavy cotton marquisette, and it appears that it would be worth while to pay the higher price. Only two examples of each of these fabrics were tested. As a group, the three higher priced filets were somewhat stronger than the three lower priced fabrics. In both cotton voile and lightweight cotton marquisette, strength tended to increase with price up to a certain point, then decreased slightly. It appears justifiable to pay a price greater than average for filet, cotton voile, and lightweight cotton marquisette, but it would not be necessary to pay the highest price to obtain a good grade of these fabrics.

There was little relation between strength and price in ninon, lightweight viscose marquisette, or bobbinet. One might as well buy these fabrics at the lowest prices, except that it would be necessary to pay the higher prices to secure a wide ninon. In general, approximately the same relationships existed between price and strength after exposure to light and when wet as in the original fabric.

Price was not closely related to shrinkage; expensive fabrics sometimes shrank more than cheap ones.

Although the least expensive cotton marquisettes and filets faded most noticeably in sunlight, there appeared to be little relation between price and colorfastness to light in other fabrics. Differences in color changes resulting from the standard method of washing were small, and price relationships were not apparent.

The relation of fiber content to durability and serviceability.—Cotton voiles were stronger than rayon voiles and ninons, except that the lowest priced cotton voile was inferior in some respects to some rayons. Among the rayon plain weave fabrics, cuprammonium voile was the strongest and ninon the weakest, with viscose voile in an intermediate position. The same relationships existed in these fabrics after exposure to light, except for the great weakening of cuprammonium voile in the filling direction after exposure at the north window.

A somewhat different situation existed among the lightweight marquisettes. Lightweight cotton marquisettes were stronger than similar rayon marquisettes in the warp direction but weaker than similar rayons in the filling direction (with one exception, the filling of cellulose acetate marquisette). The heavy viscose marquisette was weaker on the warp than the two heavy cotton marquisettes and intermediate in strength on the filling direction.

In general, the same relationships existed after exposure to light as in the original fabrics.

The strength of rayon voiles and ninons was much less when wet than when dry; the strength of wet voiles and ninons therefore was considerably less than that of the weakest wet cotton voile. The wet warp strength of rayon marquisettes was far inferior to that of cotton marquisettes, and the wet filling strength of lightweight rayon marquisettes was approximately the same as that of the poorest cotton marquisette. Consequently, the poor balance in cotton marquisettes might not be as much of a disadvantage (in comparison to rayon marquisette) as it first seemed. The low wet strength of rayons would necessitate careful handling in laundering. All of the rayons except the filling of ninon lost appreciably more strength after 20 launderings than did cotton. Consequently, in the long run, cotton voiles and marquisettes would probably give better service than similar rayons. An additional disadvantage of rayons is that they may be more expensive than corresponding cottons.

There was not a consistent relationship between fiber content and colorfastness to light and to washing (by the standard methods). However, the three fabrics which changed most in hue after exposure to sunlight were cellulose acetate rayons. After twenty launderings, one viscose and two cellulose acetate rayons changed most markedly in hue, and two cottons faded the least. Consequently, there seems to be more chance of an extreme change in color in the rayon curtain fabrics, especially those of cellulose acetate rayon, than in the cottons.

The relation of yarn and fabric construction to durability and serviceability.—If a buyer decides upon cotton or rayon fiber for glass curtains, she has the further problem of choosing the kind of fabric and the individual fabric of its kind. If she were to choose the strongest fabric of each kind, her choice of cottons in descending order of strength would be scrim, heavy marquisette, cotton voile, lightweight cotton marquisette, filet, and bobbinet. Rayons would rank as follows: heavy viscose marquisette, cuprammonium voile, viscose voile, lightweight viscose marquisette, ninon, and cellulose acetate marquisette. Except for the low rank of ninon, the relative rank of similar fabrics of the two fibers was the same.

In marquisettes and scrims, the heavy fabrics were far stronger than the lightweight fabrics. If the heavy textures were suitable for a given room, they could be expected to give longer wear. The heavy cotton scrims and marquisettes were cheaper than the best grades of corresponding lightweight fabrics, but this was not true of rayon marquisette.

Plied yarns appeared to be an important factor in quality in cotton voiles and cotton marquisettes. Yarn twist also seemed to be a factor in some cases. Filets with 10 or 12 meshes to the inch were usually stronger, especially in the filling direction, than those with fewer meshes to the inch. Filling yarn count may have been related to filling strength in low-priced cotton marquisette. Chiefly because of their low filling yarn count, cotton marquisettes had an especially low filling strength and might consequently be expected to split warpwise in time. Cotton bobbinet and filet were also weak in the filling direction.

After laundering and stretching 20 times, ninon was stronger than cellulose acetate marquisette, and viscose voile was stronger than viscose marquisette. Also these plain weave fabrics lost a smaller proportion of their strength than did the corresponding rayon marquisettes. However, this was not true of cotton voiles and marquisettes.

Shrinkage was related to yarn and fabric construction. Shrinkage tended to be highest in marquisettes and bobbinets.

ALLOWANCE FOR SHRINKAGE

Allowances for shrinkage depend on the fiber content, type of construction, and whether the fabric is to be ironed or stretched. On the basis of tests carried out in this study, it would be safest to make the following warpwise allowances for shrinkage in inches per yard if the fabrics are to be ironed after washing: 2 inches for bobbinet, scrim, cuprammonium voile, ninon, and cellulose acetate rayon marquisette; 3 inches for cotton voile, single-ply lightweight cotton marquisette, and heavy cotton marquisette; 3½ inches for viscose voiles, two-ply lightweight cotton marquisettes, and filet; 6½ inches for lightweight viscose marquisette; and 7½ inches for heavy viscose marquisette. These allowances are probably generous because in the test, the iron was pressed down upon the fabric without the sliding motion that is likely to be used in home ironing.

Even when fabrics were washed and stretched they were likely to shrink with repeated washings. Although shrinkage was not measured on stretched samples, the increase in yarn count and the obvious change in size indicated appreciable shrinkage in nearly all fabrics with the possible exception of rayon voile and ninons, which showed some tendency to stretch.

Allowance for shrinkage in the filling direction usually is not as essential as in the warp direction, but, since filling shrinkage was appreciable in most of the fabrics tested, it would be well to use enough lengths of fabric of sufficient width to allow for ample fullness.

METHODS OF LAUNDERING

Because they lose so much strength when wet, rayon curtains should be handled carefully in laundering. To maintain the strength of plain weave curtain fabrics other than ninon, it would be best to iron rather than stretch them. If ninon could be handled carefully to prevent damage from stretchers, it would be preferable to stretch it. When ninons are ironed, they should be thoroughly damp; the iron should be warm, not hot; and pressure should not be too great, especially at hems. For a satisfactory appearance, marquisettes, filet nets, and bobbinets should be stretched. Fabrics are likely to be flatter and to have more body when stretched than when ironed.

TABLE 1.—Source, price, and width of fabrics

Fabric name and fiber content	Fabric number	Store	Price in dollars		Width in inches
			Per running yard	Per square yard	
Cotton voile	1	Department store A	0.49	0.45	38.9
	2	Department store A	.59	.49	43.4
	3	Department store B	.79	.64	44 2
	4	Furniture store	.85	.70	43.6
Cotton scrim (light)	5	Department store A	.49	.45	39.1
	6	Department store B	.69	.63	39.7
Cotton scrim (heavy)	7	Department store A	.49	.51	34.6
Viscose rayon voile	8	Department store B	.98	.74	47.8
Cuprammonium rayon voile	9	Department store A	.89	.81	39.7
Cellulose acetate rayon ninon	10	Mail-order house	.47	.44	38.2
	11	Department store C	.69	.64	38.9
	12	Department store A	1.00	.72	49.7
	13	Furniture store	1.15	.86	47.9
Cotton marquisette (light)	14	Mail-order house	.06	.06	39.0
	15	Variety store	.10	.09	39.6
	16	Mail-order house	.10	.09	39.2
	17	Department store A	.19	.17	40.1
	18	Department store A	.49	.46	38.6
	19	Department store B	.69	.63	39.6
	20	Department store A	.79	.59	47.8
Cotton marquisette (heavy)	21	Mail-order house	.18	.17	37.9
	22	Department store A	.29	.27	38.7
Viscose rayon marquisette (light)	23	Department store C	.59	.44	47.9
	24	Furniture store	.65	.49	47.8
Viscose rayon marquisette (heavy)	25	Furniture store	1.15	.86	48.1
Cellulose acetate rayon marquisette	26	Mail-order house	.37	.35	38.3
Cotton bobbinet	27	Department store A	.79	.56	50.6
	28	Department store C	.89	.59	54.2
	29	Department store B	.98	.65	54.4
	30	Department store A	1.10	.76	52.0
Cotton filet	31	Furniture store	.50	.40	45.5
	32	Department store A	.59	.46	46.0
	33	Department store C	.79	.62	43.8
	34	Department store C	.89	.73	44.1
	35	Department store C	1.00	.83	43.4
	36	Department store A	1.25	1.02	44.2

TABLE 2.—Physical properties of yarns and fabrics

Fabric name and fiber content	Fabric number	Number of plies warp and filling	Yarn number (Typp)*		Direction and number of twists per inch				Yarn count per inch		Mesh count per inch		Thickness in inches	Oven-dry weight in oz. per sq. yd.
					Warp		Filling							
			Warp	Filling	Single	Ply	Single	Ply	Warp	Filling	Warp	Filling		
Cotton voile	1	1	49.8	46.6	40.0 Z	......	51.3 Z	......	60.0	53.4	......	......	0.008	1.44
	2	2	46.1	44.9	30.7 Z	37.5 Z	31.0 Z	39.9 Z	60.5	50.7	......	......	.008	1.48
	3	2	46.7	43.7	20.1 Z	54.9 Z	20.7 Z	57.6 Z	60.7	49.8	......	......	.007	1.46
	4	2	48.7	48.2	20.2 Z	62.2 Z	20.8 Z	53.5 Z	61.1	52.3	......	......	.007	1.45
Cotton scrim (light)	5	2	23.8	20.8	30.1 Z	38.4 S	34.8 Z	41.4 S	39.0	34.5	......	......	.011	2.01
	6	2	20.1	20.0	22.4 Z	43.6 S	23.5 Z	44.2 S	38.0	36.3	......	......	.011	2.26
Cotton scrim (heavy)	7	3	6.7	9.4	19.8 Z	16.0 S	21.1 Z	16.3 S	25.0	23.1	......	......	.020	4.49
Viscose rayon voile	8	1	63.1	63.2	24.9 S	......	30.5 S	......	61.8	55.4	......	......	.006	1.09
Cuprammonium rayon voile	9	1	63.5	60.6	28.6 S	......	28.8 S	......	84.6	75.7	......	......	.006	1.49
Cellulose acetate rayon ninon	10	1	67.9	63.9	22.7 S	......	27.1 S	......	81.5	74.3	......	......	.006	1.41
	11	1	61.5	60.4	27.9 S	......	29.1 S	......	85.3	80.4	......	......	.007	1.66
	12	1	60.6	59.2	27.9 S	......	28.5 S	......	84.7	81.3	......	......	.007	1.66
	13	1	68.0	65.3	23.9 S	......	27.2 S	......	80.1	72.2	......	......	.006	1.40
Cotton marquisette (light)	14	1	38.1	36.0	18.5 Z	......	27.0 Z	......	43.8	17.4	19.9	16.4	.010	.99
	15	1	37.0	37.0	21.4 Z	......	28 6 Z	......	46.0	19.1	21.0	18.1	.010	1.20
	16	1	38.8	33.2	13.4 Z	......	28.4 Z	......	48.1	21.2	22.0	20.2	.009	1.15
	17	1	45.9	50.3	24.0 Z	......	37.2 Z	......	58.2	32.5	27.1	31.5	.008	1.17
	18	2	44.7	44.3	33.7 Z	42.0 Z	34.8 Z	42.2 Z	56.1	32.4	26.0	31.4	.009	1.31
	19	2	43.9	42.2	33.9 Z	37.4 Z	33.3 Z	43.8 Z	54.3	33.7	25.2	32.7	.009	1.34
	20	2	46.7	44.9	33.6 Z	40.4 Z	34.5 Z	46.1 Z	56.6	33.7	26.3	32.7	.009	1.34

TABLE 2.—Physical properties of yarns and fabrics—Continued

Fabric name and fiber content	Fabric number	Number of plies warp and filling	Yarn number (Typp)*		Direction and number of twists per inch				Yarn count per inch		Mesh count per inch		Thickness in inches	Oven-dry weight in oz. per sq. yd.
					Warp		Filling							
			Warp	Filling	Single	Ply	Single	Ply	Warp	Filling	Warp	Filling		
Cotton marquisette (heavy)...............	21	2	10.1	10.0	20.4 Z	21.4 S	22.7 Z	24.5 S	28.0	15.0	12.0	14.0	0.018	2.73
	22	2	9.6	5.5	19.4 Z	15.4 S	17.1 Z	11.9 S	29.0	13.4	12.5	12.4	.020	3.47
Viscose rayon marquisette (light)................	23	1	31.8	31.7	23.4 S	....	22.6 S	....	46.0	30.0	21.0	29.0	.009	1.48
	24	1	32.7	33.0	22.7 S	....	22.2 S	....	46.0	30.1	21.0	29.1	.009	1.45
Viscose rayon marquisette (heavy)...............	25	1	10.8	10.8	14.7 S	....	13.8 S	....	26.7	17.5	11.4	16.5	.015	2.60
Cellulose acetate rayon marquisette	26	1	31.5	29.4	23.2 S	....	26.6 S	....	37.7	29.4	16.8	28.4	.010	1.37
Cotton bobbinet..........	27	2	....	....	....	....	....	....	....	....	14.3	10.5	.013	1.48
	28	2	....	....	....	....	....	....	....	....	14.6	11.2	.010	.82
	29	2	....	....	....	....	....	....	....	....	14.4	11.3	.010	.84
	30	2	....	....	....	....	....	....	....	....	16.3	11.2	.015	1.42
Cotton filet	31	2	....	....	....	....	....	....	....	....	6.9	6.9	.018	1.83
	32	2	....	....	....	....	....	....	....	....	7.9	7.3	.017	1.74
	33	2	....	....	....	....	....	....	....	....	10.3	9.7	.016	1.71
	34	2	....	....	....	....	....	....	....	....	10.1	10.3	.015	1.44
	35	2	....	....	....	....	....	....	....	....	12.6	12.0	.016	2.04
	36	2	....	....	....	....	....	....	....	....	12.4	12.0	.013	1.43

*Calculated on the oven-dry basis. The equivalent single number is given for plied yarns.

TABLE 3.—Breaking strength in pounds before and after various treatments*

Fabric name and fiber content	Fabric number	Original dry		Original wet		Fading frame		Fade-Ometer		North window	
		Warp	Filling	Warp	Filling	Warp	Filling	Warp	Filling	Warp	Filling
Cotton voile	1	18.1	14.4	18.8	14.0	18.0	12.5	17.9	12.7	16.0	11.2
	2	25.4	22.4	26.0	22.5	24.7	20.0	27.3	20.0	23.5	19.5
	3	31.4	26.0	33.8	26.4	25.9	21.6	29.0	23.2	27.8	23.0
	4	28.6	25.1	28.1	26.4	23.8	21.4	25.4	24.0	26.8	23.0
Cotton scrim (light)	5	35.8	32.2	41.5	35.6	35.1	29.0	36.6	30.6	34.2	28.8
	6	44.9	41.5	46.9	42.4	40.6	36.1	42.6	38.0	35.8	30.6
Cotton scrim (heavy)	7	74.8	57.8	82.0	66.8	67.7	51.0	69.8	53.0	67.3	50.0
Viscose rayon voile	8	18.7	17.2	8.7	7.8	17.6	15.8	17.8	16.8	16.1	13.1
Cuprammonium rayon voile	9	24.3	21.8	12.8	11.8	21.2	19.3	22.6	19.2	17.7	9.9
Cellulose acetate rayon ninon	10	16.4	14.6	8.9	8.6	16.1	13.5	17.0	15.2	15.2	11.9
	11	17.5	15.4	9.8	8.8	16.0	14.8	17.0	15.4	15.1	12.8
	12	16.8	14.2	9.6	8.3	15.4	13.9	16.3	14.3	14.8	13.1
	13	15.4	13.8	9.0	8.4	15.1	13.2	16.0	13.7	14.8	11.5
Cotton marquisette (light)	14	29.5	5.8	28.6	6.1	26.7	5.4	27.5	5.6	20.3	4.7
	15	30.4	7.9	34.3	8.8	24.8	7.1	26.6	7.7	23.3	6.9
	16	30.4	9.1	31.6	10.2	29.1	8.5	30.1	8.8	25.6	7.2
	17	23.3	9.9	28.6	11.1	20.2	9.3	21.2	10.0	19.2	8.5
	18	30.8	15.4	31.6	14.9	26.9	13.4	29.4	15.0	25.4	11.8
	19	30.0	12.8	31.6	13.8	25.6	11.1	28.2	12.0	20.0	8.8
	20	30.9	13.6	32.4	14.0	26.2	10.1	27.6	12.3	20.3	9.3
Cotton marquisette (heavy)	21	45.1	24.6	50.0	26.3	40.5	18.6	44.6	23.3	40.6	19.0
	22	61.3	39.9	70.6	42.7	54.4	34.6	61.3	36.4	50.6	32.4
Viscose rayon marquisette (light)	23	21.0	15.8	10.3	6.6	16.0	12.8	17.8	15.4	15.6	12.8
	24	23.5	16.0	10.9	5.7	18.1	12.4	18.6	14.6	13.4	12.2
Viscose rayon marquisette (heavy)	25	41.4	27.8	17.3	12.6	37.2	24.7	35.6	26.2	34.2	24.2
Cellulose acetate rayon marquisette	26	12.5	11.8	8.5	6.2	11.5	8.6	11.6	9.2	11.8	8.5
Cotton bobbinet	27	15.0	9.1	18.6	12.1	13.8	9.5	14.4	8.4	12.0	8.0
	28	15.4	5.3	15.7	5.9	13.9	5.7	13.8	5.0	12.4	4.4
	29	14.6	4.2	15.6	5.5	14.0	4.9	14.8	4.6	11.3	4.1
	30	20.7	5.7	18.0	5.8	18.0	5.0	18.6	5.8	16.2	4.7
Cotton filet	31	17.8	5.3	21.1	8.7	17.0	6.0	17.4	5.3	17.1	5.7
	32	17.8	4.7	18.8	7.6	17.4	5.6	17.4	4.9	17.2	5.6
	33	16.6	5.4	17.8	8.4	17.2	4.3	17.0	5.1	15.5	4.2
	34	26.3	8.7	27.9	13.0	22.0	7.7	25.2	8.0	17.6	5.8
	35	16.3	8.4	18.3	12.4	17.4	6.5	17.8	7.4	16.8	6.6
	36	22.2	7.4	25.5	9.2	24.3	8.0	24.0	7.8	20.6	6.5

*Raveled-strip method.

TABLE 4.—Percentage gains and losses in breaking strength

Fabric name and fiber content	Fabric number	Original wet		Fading frame		Fade-Ometer		North window	
		Warp	Filling	Warp	Filling	Warp	Filling	Warp	Filling
Cotton voile	1	+ 4.1	− 3.1	− 0.3	−13.5	− 1.1	−12.1	−11.6	−22.1
	2	+ 2.4	+ .4	− 2.8	−10.7	+ 7.5	−10.7	− 7.5	−12.9
	3	+ 7.5	+ 1.5	−17.5	−16.9	− 7.6	−10.8	−11.6	−11.5
	4	− 1.7	+ 5.2	−16.8	−14.9	−11.2	− 4.4	− 6.3	− 8.4
Cotton scrim (light)	5	+16.1	+10.2	− 1.8	− 9.9	+ 2.2	− 5.1	− 4.5	−10.5
	6	+ 4.5	+ 2.3	− 9.5	−13.0	− 5.2	− 8.3	−20.4	−26.4
Cotton scrim (heavy)	7	+ 9.7	+15.7	− 9.5	−11.7	− 6.7	− 8.4	−10.0	−13.5
Viscose rayon voile	8	−53.5	−54.8	− 5.9	− 8.7	− 4.8	− 2.9	−13.9	−24.1
Cuprammonium rayon voile	9	−47.5	−45.6	−12.8	−11.5	− 7.0	−11.7	−27.2	−54.6
Cellulose acetate rayon ninon . .	10	−45.9	−41.1	− 2.1	− 7.5	+ 3.3	+ 3.8	− 7.9	−18.5
	11	−44.0	−43.0	− 8.9	− 4.5	− 2.9	− .3	−13.7	−16.8
	12	−42.9	−41.5	− 8.6	− 2.1	− 3.0	+ .7	−12.2	− 7.7
	13	−41.4	−39.1	− 1.6	− 4.0	+ 4.2	− .7	− 3.6	−16.7
Cotton marquisette (light) . .	14	− 3.1	+ 5.2	− 9.5	− 6.9	− 6.8	− 3.4	−31.2	−19.0
	15	+12.6	+11.4	−18.6	−10.1	−12.6	− 2.5	−23.5	−12.7
	16	+ 3.9	+12.1	− 4.4	− 6.6	− 1.1	− 3.3	−16.1	−20.3
	17	+23.0	+12.1	−13.5	− 6.1	− 9.0	+ 1.0	−17.8	−14.1
	18	+ 2.8	− 3.2	−12.7	−12.7	− 4.7	− 2.9	−17.5	−23.1
	19	+ 5.3	+ 8.2	−14.8	−12.9	− 6.2	− 5.5	−33.4	−31.0
	20	+ 4.7	+ 3.7	−15.2	−25.5	−10.7	− 9.2	−34.3	−31.4
Cotton marquisette (heavy)	21	+11.0	+ 6.9	−10.2	−24.4	− 1.0	− 5.3	−10.1	−23.0
	22	+15.1	+ 7.0	−11.3	−13.2	0	− 8.6	−17.5	−18.8
Viscose rayon marquisette (light) . .	23	−51.0	−57.9	−23.6	−19.0	−15.0	− 2.5	−25.7	−19.0
	24	−53.6	−64.4	−23.0	−22.5	−20.9	− 8.4	−42.8	−23.4
Viscose rayon marquisette (heavy).	25	−58.2	−54.9	−10.2	−11.3	−13.9	− 5.9	−17.2	−13.1
Cellulose acetate rayon marquisette	26	−32.0	−47.5	− 8.0	−27.1	− 7.6	−22.0	− 5.2	−28.0
Cotton bobbinet . . .	27	+24.0	+33.0	− 8.0	+ 4.4	− 4.0	− 7.1	−20.0	−11.5
	28	+ 2.3	+11.3	− 9.4	+ 7.5	−10.4	− 5.7	−18.9	−17.0
	29	+ 6.8	+31.0	− 4.1	+16.7	+ .7	+ 9.5	−22.9	− 2.4
	30	−12.8	+ 1.8	−13.0	−12.3	−10.1	+ .9	−21.5	−17.5
Cotton filet	31	+18.2	+64.2	− 5.0	+12.3	− 2.8	0	− 4.2	+ 7.5
	32	+ 5.9	+61.7	− 2.3	+19.1	− 1.7	+ 4.3	− 3.4	+19.1
	33	+ 7.6	+55.6	+ 3.9	−20.4	+ 2.7	− 5.6	− 6.3	−22.2
	34	+ 6.1	+48.9	−16.3	−11.5	− 4.2	− 8.6	−33.1	−33.3
	35	+12.3	+48.2	+ 6.7	−22.6	+ 8.9	−12.5	+ 2.8	−22.0
	36	+14.9	+23.5	+ 9.4	+ 6.7	+ 8.1	+ 4.7	− 7.2	−12.8

TABLE 5.—Elongation and finishing materials

Fabric name and fiber content	Fabric number	Percentage elongation		Percentage of finishing materials removed by			
		Warp	Filling	Diastase	Carbon tetrachloride	Ethyl alcohol	Total
Cotton voile	1	6.9	11.0	0.03	0.12	0.86	1.01
	2	9.0	12.9	.50	.22	2.51	3.23
	3	9.0	12.5	.60	.14	.17	.91
	4	8.5	13.1	.18	.16	1.64	1.98
Cotton scrim (light)	5	6.7	12.5	.64	.22	+	.86
	6	11.0	14.4	.97	.20	+	1.17
Cotton scrim (heavy)	7	10.8	14.8	.25	.07	+	.32
Viscose rayon voile	8	16.9	19.8	.53	.22	+	.75
Cuprammonium rayon voile	9	13.8	18.3	1.38	.37	1.20	2.95
Cellulose acetate rayon ninon	10	12.1	21.2	+	.09	3.21	3.30
	11	30.2	28.8	+	.34	2.21	2.55
	12	27.9	24.2	+	.33	2.08	2.41
	13	16.2	25.2	+	.31	1.89	2.20
Cotton marquisette (light)	14	6.5	8.8	4.61	+	.32	4.93
	15	8.1	9.6	1.93	+	+	1.93
	16	6.0	9.8	1.75	.27	3.32	5.34
	17	8.3	8.3	1.47	.40	+	1.87
	18	16.5	12.5	.68	.65	+	1.33
	19	15.6	14.0	.96	.39	+	1.35
	20	14.6	15.0	.33	.15	+	.48
Cotton marquisette (heavy)	21	13.8	12.5	2.74	.09	+	2.83
	22	14.0	9.6	.54	.11	.63	1.28
Viscose rayon marquisette (light)	23	22.9	20.6	9.03	.27	.33	9.63
	24	28.8	20.0	2.10	.05	+	2.15
Viscose rayon marquisette (heavy)	25	23.5	18.8	2.44	.07	+	2.51
Cellulose acetate rayon marquisette	26	15.8	27.3	1.63	.12	1.05	2.80
Cotton bobbinet	27	15.8	20.2	3.31	.18	+	3.49
	28	15.0	18.1	1.81	.31	1.64	3.76
	29	15.6	15.6	2.40	.23	1.84	4.47
	30	6.7	36.0	7.56	.44	9.69	17.69
Cotton filet	31	10.0	44.0	4.14	.08	3.16	7.38
	32	7.1	56.2	4.11	.07	3.05	7.23
	33	9.2	46.5	2.25	.85	2.61	5.71
	34	12.3	46.6	3.13	.09	.31	3.53
	35	9.4	51.2	2.70	.91	.69	4.30
	36	10.4	52.1	3.73	.30	.41	4.44

TABLE 6.—Breaking strength in pounds (grab method) and percentage gains and losses in breaking strength due to laundering

Fabric name and fiber content	Fabric number	Warp					Filling				
		Original pounds	Ironed		Stretched		Original pounds	Ironed		Stretched	
			Pounds	Per cent change	Pounds	Per cent change		Pounds	Per cent change	Pounds	Per cent change
Cotton voile	2	29.2	29.4	+ 0.5	28.8	− 1.7	25.0	27.8	+11.0	26.7	+ 6.8
Cotton scrim (light)	6	47.5	46.9	− 1.3	45.4	− 4.5	46.8	44.9	− 4.2	43.0	− 8.1
Viscose rayon voile	8	27.9	24.1	−13.6	22.8	−18.3	25.3	24.4	− 3.6	23.1	− 8.7
Cuprammonium rayon voile	9	31.2	26.3	−15.7	24.8	−20.5	30.0	27.3	− 9.2	26.1	−13.1
Cellulose acetate rayon ninon	10	20.4	14.4	−29.8	20.2	− 1.2	22.7	17.8	−21.8	22.6	− .4
Cotton marquisette (light)	20	34.2	....	....	35.0	+ 2.3	17.2	....	....	19.0	+10.8
Viscose rayon marquisette (light)	23	29.0	....	....	19.4	−33.4	23.2	....	....	16.7	−28.0
Cellulose acetate rayon marquisette	26	15.9	....	....	14.8	− 6.9	16.8	....	....	14.2	−16.0
Cotton bobbinet	28	15.5	....	....	13.7	−11.6	11.2	....	....	11.3	+ .9
Cotton filet	33	16.3	....	....	15.3	− 6.1	12.6	....	....	13.0	+ 2.8

TABLE 7.—Maximum residual shrinkage

Fabric name and fiber content	Fabric number	Shrinkage: Per cent, Warp	Shrinkage: Per cent, Filling	Shrinkage: Inches per yard, Warp	Shrinkage: Inches per yard, Filling
Cotton voile	1	2.0	4.3	0.7	1.6
	2	7.5	9.6	2.7	3.5
	3	4.3	6.2	1.6	2.2
	4	6.9	8.6	2.5	3.1
Cotton scrim (light)	5	4.8	8.2	1.7	3.0
	6*	5.4	8.3	1.9	3.0
Cotton scrim (heavy)	7	4.5	6.4	1.6	2.3
Viscose rayon voile	8	9.4	6.5	3.4	2.3
Cuprammonium rayon voile	9	5.7	5.6	2.0	2.0
Cellulose acetate rayon ninon	10	2.9	9.4	1.0	3.4
	11	5.2	2.8	1.9	1.0
	12	5.0	3.2	1.8	1.2
	13	4.8	5.8	1.7	2.1
Cotton marquisette (light)	14	7.7	13.8	2.8	5.0
	15	5.5	15.8	2 0	5.7
	16	5.9	12.7	2.1	4.6
	17	5.7	17.5	2.0	6.3
	18	10.0	18.8	3.6	6.8
	19	8.2	23.4	3.0	8.4
	20	8.8	20.8	3.2	7.5
Cotton marquisette (heavy)	21	7.7	15.6	2.8	5.6
	22	6.7	10.2	2.4	3.7
Viscose rayon marquisette (light)	23	17.9	9.9	6.4	3.6
	24	18.4	10.3	6.6	3.7
Viscose rayon marquisette (heavy)	25	20.9	13.3	7.5	4.8
Cellulose acetate rayon marquisette	26	5.5	8.2	2.0	3.0
Cotton bobbinet	27	+1.2	26.0	+ .4	9.4
	28	+1.4	25.1	+ .5	9.0
	29	+2.9	23.8	+1.0	8.6
	30	4.1	24.5	1.5	8.8
Cotton filet	31	6.8	4.5	2.4	1.6
	32	8.6	5.9	3.1	2.1
	33	8.4	6.6	3.0	2.4
	34	5.1	6.2	1.8	2.2
	35	9.0	5.8	3.2	2.1
	36	5.8	5.6	2.1	2.0

*Only one sample tested.

TABLE 8.—Means of data for various types of curtain fabrics

Test	Cotton voile	Cotton scrim (light)	Cotton scrim (heavy)*	Viscose rayon voile*	Cuprammonium rayon voile*	Cellulose acetate rayon ninon	Cotton marquisette (light)	Cotton marquisette (heavy)	Viscose rayon marquisette (light)	Viscose rayon marquisette (heavy)*	Cellulose acetate rayon marquisette*	Cotton bobbinet	Cotton filet
Fabric numbers	1, 2, 3, 4	5, 6	7	8	9	10, 11, 12, 13	14, 15, 16, 17, 18, 19, 20	21, 22	23, 24	25	26	27, 28, 29, 30	31, 32, 33, 34, 35, 36
Price in dollars per running yard	.68	.59	.49	.98	.89	.83	.35	.24	.62	1.15	.37	.94	84
Price in dollars per square yard	.57	.54	.51	.74	.81	.67	.30	.22	.47	.86	.35	.64	.68
Width in inches	42.5	39.4	34.6	47.8	39.7	43.7	40.5	38.3	47.8	48.1	38.3	52.8	44.5
Yarn number (typp, oven-dry basis)													
Warp	47.8	22.0	6.7	63.1	63.5	64.5	42.2	9.9	32.2	10.8	31.5	....	....
Filling	45.9	20.4	9.4	63.2	60.6	62.2	41.1	7.8	32.3	10.8	29.4	....	....
Yarn count per inch													
Warp	60.6	38.5	25.0	61.8	84.6	82.9	51.8	28.5	46.0	26.7	37.7	....	....
Filling	51 6	35.4	23.1	55.4	75.7	77.1	27.1	14.2	30.0	17.5	29.4	.....	....
Mesh count per inch													
Warp	....	......	....	......	......	......	23.9	12.2	21.0	11.4	16.8	14.9	10.0
Filling	....	..	......	.....	.....	.....	26.1	13.2	29.0	16.5	28.4	11.1	9.7
Thickness in inches	.007	.011	.020	.006	.006	.006	.009	.019	.009	.015	.010	.012	.016
Weight in ounces per square yard	1.46	2.14	4.49	1.09	1.49	1.53	1.21	3.10	1.47	2.60	1.37	1.14	1.70
Breaking strength in pounds													
Warp	25.9	40.3	74.8	18.7	24.3	16.5	29.4	53.2	22.2	41.4	12.5	16.4	19.5
Filling	22.0	36.9	57.8	17.2	21.8	14.5	10.6	32.2	15.9	27.8	11.8	6.1	6.7
Change in breaking strength (%)													
Original wet, Warp	+ 3.1	+10.3	+ 9.7	—53.5	—47.5	—43.5	+ 7.0	+13.0	—52.3	—58.2	—32.0	+ 5.1	+10.8
Filling	+ 1.0	+ 6.3	+15.7	—54.8	—45.6	—41.2	+ 7.1	+ 7.0	—61.1	—54.9	—47.5	+19.2	+50.3
Fading frame, Warp	— 9.3	— 5.6	— 9.5	— 5.9	—12.8	— 5.3	—12.7	—10.7	—23.3	—10.2	— 8.0	— 8.6	— .6
Filling	—14.0	—11.5	—11.7	— 8.7	—11.5	— 4.5	—11.6	—18.8	—20.7	—11.3	—27.1	+ 4.1	— 2.7
Fade-Ometer, Warp	— 3.1	— 1.5	— 6.7	— 4.8	— 7.0	+ .4	— 7.3	— .5	—17.9	—13.9	— 7.6	— 6.0	+ 1.9
Filling	— 9.5	— 6.7	— 8.4	— 2.9	—11.7	+ .9	— 3.7	— 7.0	— 5.5	— 5.9	—22.0	— .6	— 3.0
North window, Warp	— 9.2	—10.2	—10.0	—13.9	—27.2	— 9.4	—24.8	—13.8	—34.2	—17.2	— 5.2	—20.8	— 8.6
Filling	—13.7	—18.5	—13.5	—24.1	—54.6	—14.9	—21.6	—20.9	—21.2	—13.1	—28.0	—12.1	—10.6
Elongation, per cent, Warp	8.8	8.9	10.8	16.9	13.8	21.6	10.8	13.9	25.8	23.5	15.8	13.3	9.7
Filling	12.4	13.4	14.8	19.8	18.3	24.8	11.1	11.0	20.3	18.8	27.3	22.5	49.4
Shrinkage, per cent, Warp	5.2	5.1	4.5	9.4	5.7	4.7	7.4	7.2	18.2	20.9	5.5	+ .4	7.3
Filling	7.2	8.2	6.4	6.5	5.6	5.3	17.5	12.9	10.1	13.3	8.2	24.8	5.8
In. per yd., Warp	1.9	1.8	1.6	3.4	2.0	1.6	2.7	2.6	6.5	7.5	2.0	+ .1	2.6
Filling	2.6	3.0	2.3	2.3	2.0	1.9	6.3	4.6	3.6	4.8	3.0	9.0	2.1

*Only one fabric tested.

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